



Hazardous Substances  
Technical Liaisons

(....old name)

**OFFICE OF RESEARCH AND DEVELOPMENT**  
**SUPERFUND AND TECHNOLOGY LIAISON** (new name)  
**REGION 9 NEWSLETTER**  
Spring 2007, Edition 39

Hello again and welcome to another edition of the newsletter. For this issue, I've collected a few good stories on successes in cleanups, including the application of ISCO at the Cooper Drum site, a new sediments characterization tool, the approval of a new bioassay system array under the SW-846 program, and bioremediation of perchlorate in groundwater, among others. There is also a call for new membership in EPA's "Engineering Forum". Also, I've compiled the latest in technical and guidance documents and listed upcoming conferences and training. Hopefully, some of it will be useful to you!

For more detail on the ORD tech support that is offered to you (EPA staff), check out our "STL" webpages:

For EPA staff..... <http://intranet.epa.gov/ospintra/scienceportal/htm/hstl.htm> .  
For anyone online..... <http://www.epa.gov/osp/hstl.htm> .

They are very similar, except for a section on "HSTL activities". (Hmmm....I guess we need to update a few acronyms....)

Which leads me to this: I've got a new "title", as shown up above, but this newsletter (and most of my job) is still the same. I am now your "Superfund and Technology Liaison", recognizing that many of us (STLs) will soon be assisting with a new technology related role. I will still connect you (Superfund, RCRA, and Brownfields program staff) with ORD technical support for your waste related needs and bring you the latest in related technology and information from the cleanup world. But ORD has given us this new title. More on that next time.

One final word: Congratulations to two of my recently retired colleagues! Norm Kulujian, who was the technical liaison in Philadelphia for 16 years, and Jerry Jones of the ORD Lab in Ada, Oklahoma, are sleeping later and enjoying life a bit more these days. We'll miss 'em both!

Mike Gill  
EPA Region 9  
ORD Superfund and Technology Liaison  
415-972-3054

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# NATIONAL NEWS

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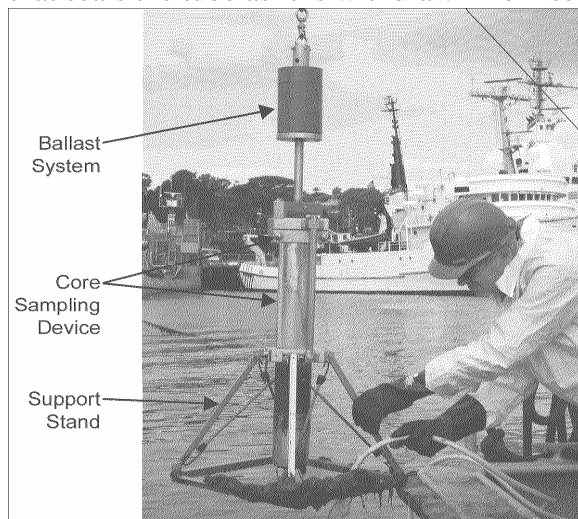
## New Tools and Technologies

### New Sampler Minimizes Disturbance During Sediment Collection

(From Tech News and Trends, March, 2007)

The U.S. EPA Office of Research and Development (ORD) National Exposure Research Laboratory (NERL) has developed an innovative tool known as the undisturbed surface sediment (USS) sampler. The instrument is designed to collect the upper 15 cm (6 in) of sediment in layers as thin as 1 cm for laboratory analysis. Recent field applications demonstrate that the sampler can collect thin layers of newly deposited sediment without mixing surface and subsurface layers, a problem commonly associated with conventional sampling methods.

The USS sampler consists of a support stand, core sampling device, and ballast system (Figure 1). During deployment, the sampler is lowered from a boat to the sediment surface, where the support stand is placed approximately 1 ft from target sediment to minimize surface/sediment interference. Within the core sampling device, a top-and-clamp block secures a 4 inch diameter core tube as it slides down and up during sample collection. A nose piece mounted at the lower end of the core tube releases a core catcher that seals the tube as it is withdrawn from sediment.



*Clear water above the core sample held in a USS sampler illustrates that minimal sample disturbance occurs during sample collection.*

For the complete article, see: <http://www.clu-in.org/download/newsletters/tnandt0307.pdf>

*Contributed by Brian Schumacher, Ph.D., NERL (schumacher.brian@epa.gov or 702-798-2242), John Zimmerman, NERL (zimmerman.johnh@epa.gov or 702-798-2385), Julia Capri, Eastern Research Group (julia.capri@erg.com or 513-791-9405), and V. Elliott Smith, Ph.D., ASCi Corporation (esmiths@comcast.net or 248-342-8744).*

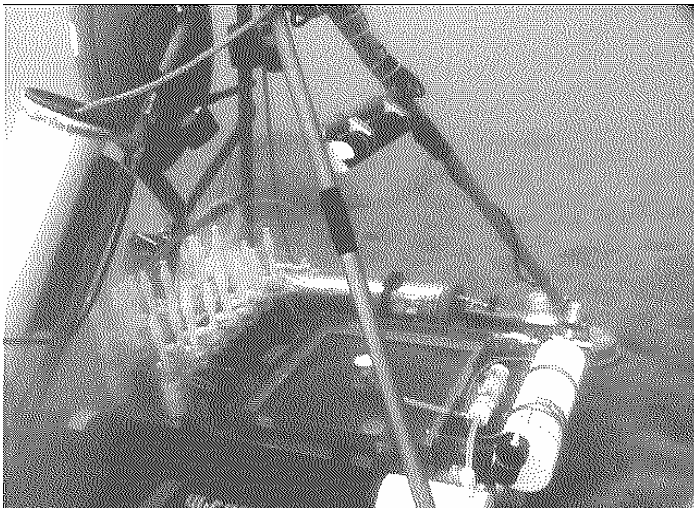
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## Combined Benthic Test Determines Metal and Organic Flux Rates in Marine Sediment

(From Tech News and Trends, March, 2007)

Contaminant flux rates from marine sediment recently were measured at Bishop Point in Pearl Harbor, HI, using the benthic flux sampling device (BFSD) developed by US Navy SPAWAR Systems Center (SSC) / San Diego. Reductions in field time and costs were achieved through simultaneous measurement of both metal and organic contaminants during 72-hour deployment of the BFSD. These measurements were compared to the results of previous Bishop Point BFSD deployments focusing on metals versus polycyclic aromatic hydrocarbons (PAHs) and on different occasions.

Comparison showed very similar quantitative and qualitative results. The tests were conducted at the Navy's Marine Diving and Salvage Unit 1 (MDSU-1) facility of Bishop Point, near the mouth of Pearl Harbor, to support ongoing cleanup of this National Priorities List site. MDSU-1 is located near active industrial and Navy operations employing numerous surfacewater vessels such as salvage and diveboats, research ships, and barges periodically moved by tugboats.



*The 4-foot-high BFSD can be dropped easily from a small boat to the sediment surface, where weighted feet help secure the 150-pound device with its assorted instrumentation.*

For the complete article, see: <http://www.clu-in.org/download/newsletters/tnandt0307.pdf>

*Contributed by Brad Davidson, SCC (bradley.davidson@navy.mil or 619-553-2804).*

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### Bioremediating Perchlorate in Contaminated Ground Water

(Edited from NRMRL News , Jan 23, 2007)

Perchlorate is a toxic chemical compound whose widespread contamination of U.S. ground water became recognized in the late 1990s with the introduction of new detection methods. Because it is chemically unreactive, perchlorate is unusually difficult and costly to remove from ground water. EPA NRMRL drinking water researchers are testing alternative bioremediation approaches to make removal easier and more cost effective.

Perchlorate, which is both naturally occurring and man-made, is used in the manufacture of solid rocket propellants and explosives. The manufacturing process results in the formation of the perchlorate anion (a negatively charged atom) that is very mobile in surface and ground water, creating widespread contamination. Direct removal of perchlorate using ion exchange (to remove perchlorate from the water) may concentrate but not destroy the perchlorate and is costly. More promising cleanup technologies involve a combination of ion exchange and biological treatment (to degrade the perchlorate to a harmless state). The ion exchange process results in a highly concentrated salt waste solution (brine) that contains the perchlorate. The biological reduction step reduces the perchlorate to a harmless chloride ion and water, and allows the reuse of the brine, which makes the exchange process more sustainable and cost effective.

NRMRL researchers are using a continuous-flow membrane biofilm reactor in which hydrogen gas is supplied through the membrane to a biofilm growing on the outside of the membrane. The hydrogen gas serves as an energy source, while bicarbonate in the water serves as the carbon source for microbial growth. Research goals are to reduce the perchlorate concentrations by approximately 90 percent from ion exchange brines with high salinity, and to do it within time and cost constraints.

Although biological water treatments are not yet widely available for public drinking water systems, the NRMRL membrane biofilm technology offers a potentially ideal treatment for several reasons:

- After removal of perchlorate, the brine can be reused, avoiding high-cost disposal problems.
- The biological treatment would treat the ion exchange brine, not the drinking water stream.
- The hydrogen gas, being insoluble, does not release into the treated water.
- Because this technology uses a biofilm, the bacteria largely remain attached to the membrane rather than being released, although known perchlorate-reducing bacteria are non-pathogenic, i.e., do not cause disease.

- Any bacteria in the treated water would be removed by the usual post-treatment systems such as sand filtration.

This research is a collaborative effort with the American Water Works Association Research Foundation and Arizona State University. For further information about perchlorate risks to human health, visit EPA's perchlorate site (<http://www.epa.gov/safewater/ccl/perchlorate/perchlorate.html>).

*For further information, please contact Patricia Schultz (email: [schultz.patricia@epa.gov](mailto:schultz.patricia@epa.gov)), NRMRL Public Information Office, 513-569-7966.*

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### Breaking the Age Barrier: New Research in Ground Water Quality (Edited from NRMRL News, Feb 12, 2007)

Most people are familiar with the use of radiocarbon dating to place once-living objects in their historical period. In a parallel approach, EPA NRMRL hydrologists are pioneering the measurement of naturally occurring radioactive isotopes to determine the age (that is, the residence time) of ground water in support of watershed contamination studies.

While age-dating of young ground water (ground water that's less than 50 years old) is a frontier field in watershed studies, it has long been realized that very young ground water could be a more significant source of contamination than older water. This is true because a shorter residence time means that ground water moves "faster." Thus, contamination will get to the drinking water well from the recharge area (point of entry) faster if the ground water is younger.

However, it has been difficult to measure the exact age of young ground water. The conventional indicator has been tritium, a radioactive form of hydrogen, but its usefulness has nearly ended because of a short half-life combined with its last significant input to the atmosphere from thermonuclear tests of the early 1950s. NRMRL isotope hydrologists believe that dissolved krypton gas (in the isotope form of <sup>85</sup>Kr) may be the best indicator, among the other potentially useful isotopes tested, of young recharge water.

<sup>85</sup>Kr is ideal for several reasons:

- It has increased in precipitation since the 1950s at a relatively constant rate.
- It has an appropriately short half-life.
- It is almost uniformly distributed in the northern hemisphere.

Furthermore, because it is chemically inert, it retains its unique isotope characteristics while it decays as predictably as the unwinding of a clock. Until recently, the chief shortcoming of this method was the daunting task of collecting voluminous water samples to measure traces of the rare <sup>85</sup>Kr isotope. Finally, a breakthrough in field



collection and laboratory measurement has permitted the new <sup>85</sup>Kr isotope method to detect ground water as young as 2 years and as old as 50 years.

For the first time, the widespread economical use of the new <sup>85</sup>Kr method has been applied to selected watersheds where elevated natural occurrences of arsenic and lead have prompted hydrologists to ask whether, and how, the ground water will flush these materials out over time. Recent research in Maine, for example, suggests that a vulnerability map can be plotted using the new <sup>85</sup>Kr technique, either alone or through integration with conventional hydrology investigations. In cooperation with the State of Maine and rural ground water supply districts, NRMRL researchers are using this innovative approach to help diagnose prospective contamination areas so that water supply managers can effectively plan well fields to ensure a stable supply of clean drinking water.

Detailed information is available in: Sidle, W.C. 2006. "Apparent <sup>85</sup>Kr Ages of Ground Water Within the Royal Watershed, Maine, USA." *Journal of Environmental Radioactivity*. 91:113-127.

*For further information, please contact Patricia Schultz, NRMRL Public Information Office, 513-569-7966.*

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### EPA Approves SBRP Project Investigator Dr. Michael Denison's CALUX<sup>®</sup> Assay (from NIEHS SBRP e-Posted Notes, 3/30/07)

The EPA SW-846 working group (*Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*) has officially approved the Chemically-Activated Luciferase gene expression cell bioassay system (CALUX<sup>®</sup>) assay (EPA number 4435) developed by UC Davis SBRP Project Investigator Michael Denison. The method will be published in the near future (April or May). The CALUX<sup>®</sup> assay is able to detect all compounds that can activate the aryl hydrocarbon receptor (AhR) and AhR-dependent gene expression. The method enables quick and cheap determination of contamination and is every bit as sensitive as gas-chromatography mass-spectroscopy (GS/MS) assay. Its sensitivity, cost, and speed make it ideal for use as both a screening assay and research tool.

The EPA group defines acceptable, although not required, methods for the regulated and regulatory communities to use in responding to RCRA-related sampling and analysis requirements. Because of this approval, EPA remediation contractors will now be able to use the CALUX<sup>®</sup> method. Because other countries look to the US EPA for approval or validation of methods before they are implemented, the EPA approval is a very important step in getting the technology used throughout the world and the US. More information on Dr. Denison's SBRP funded research can be found on the SBRP web site ([http://www-apps.niehs.nih.gov/sbrp/programs/Program\\_detail.cfm?Project\\_ID=P42ES46990013](http://www-apps.niehs.nih.gov/sbrp/programs/Program_detail.cfm?Project_ID=P42ES46990013)) . A

more in-depth explanation of CALUX® can be found on Dr. Denison's [company web site](http://www.dioxins.com/index.html) (<http://www.dioxins.com/index.html>).

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## Army Interim Vapor Intrusion Policy

(From Lenny Siegel - Director, Center for Public Environmental Oversight [CPEO], Feb 21, 2007)

On November 6, 2006, Deputy Assistant Secretary of the Army (Environment, Safety, and Occupational Health) Tad Davis signed out an Interim Vapor Intrusion Policy for Environmental Response Actions. The five-page document is not technical guidance: The Tri-Service Environmental Risk Assessment Working Group hopes to issue such guidance "within the year."

The policy is fairly straightforward. It notes that vapor intrusion investigations may be mounted under the Superfund Law or RCRA (Resource Conservation and Recovery Act) Corrective Action. It states: "While the federal and State guidances may be a useful resource, they do not qualify as an Applicable or Relevant and Appropriate Requirements under CERCLA or as a 'media cleanup standard' under RCRA corrective action."

Modeling based on soil gas or groundwater measurements may indicate whether a potential risk exists, but "Army components are discouraged from using model output to derive quantitative risk estimates." Subsurface sampling results, the policy explains, "should be used as the basis to indicate whether indoor air and ambient/background sampling is appropriate."

The Army discusses possible land use controls, but like documents from other agencies it does not provide sufficient tools to decide whether construction should take place at a potential vapor intrusion site: "If ... modeling indicates a potential risk at an active installation, the Army may choose to amend its installation master plan, file a deed notice in accordance with State law, or utilize other appropriate land use controls, such as dig restrictions or a construction review process. Such forms of notice would inform Army employees, contractors and others that the issue of vapor intrusion must be considered if a building were to be constructed on the site in question."

If decision documents at a site have not addressed potential vapor intrusion risks, then those risks will be studied as part of a Five-year Review or, at active installations, an industrial hygiene survey.

At Formerly Used Defense Sites, "If volatile chemicals being addressed under FUDS are commingled with waste from other Potentially Responsible Parties, per FUDS policy, the Army would not pursue unilateral investigation."

According to Defense Environmental Alert (February 20, 2007), this provision created complications at the former Schilling Air Force Base, in Salina, Kansas. Reportedly the Army Corps Kansas City District received a waiver from Army headquarters to continue



its vapor investigation in Salina, even though it has not yet established a cost-sharing agreement with other potentially responsible parties.

Defense Environmental Alert says that the Army Corps is hampered by the Cooper v. Aviall court decision, which makes it difficult to recover remediation costs from other responsible parties in the absence of a government cleanup order. Ironically, the Defense Department - through the U.S. Department of Justice - has reportedly been blocking a legislative "fix" to Aviall because it is concerned that other responsible parties will come looking for cleanup funds in the Department's deep pockets.

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### Region 3 Optimization Study of Fund-Lead Pump-and-Treat Superfund Sites

(From Technical Support Times Issue #5)

A major Superfund Program initiative to optimize operation and reduce costs associated with remedial sites, has identified potential opportunities for substantial long-term savings for the operation and maintenance costs of fund-lead pump-and-treat sites. The optimization studies were conducted in EPA's Region 3 in two phases, involving two Superfund sites in phase one and eight Superfund sites in phase two. The Region 3 review team identified potential annual cost savings of \$54,000 per year for each site in the first phase and savings of \$130,000 per year for each of the eight sites in the second phase.

For the complete paper, go to: <http://www.epa.gov/osp/hstl/techsupp05.pdf>  
This is one in a series of papers written by the ORD STLs. For others, see:  
<http://www.epa.gov/osp/hstl/techsupp.htm>

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### ORD's Sample Holding Time Reevaluation

(Edited from Memo by Brian Schumacher of the ORD Las Vegas Laboratory, March 22, 2007)

A new ORD report has been released: "Sample Holding Time Reevaluation". This report is the product of a research effort performed as part of the Regional Methods Initiative program as a joint effort between the Office of Research and Development and Regions 1 and 10.

Here's the electronic link to the report:  
[http://www.epa.gov/nerlesd1/cmb/research/bs\\_033cmb06.pdf](http://www.epa.gov/nerlesd1/cmb/research/bs_033cmb06.pdf)

The report summarizes a series of experiments looking at the effects of sample holding times on concentrations of contaminants in soils and sediments. Contaminants of interest included: SVOCs (specifically PAHs), PCBs, Pesticides, Cr(VI) and several other heavy metals. Soils and sediments were collected in the field, homogenized, and held at 4 C or

-20 C for several multiples of the maximum holding times specified in SW-846. Extractions and analyses were performed in accordance with SW-846 methods.

**In general, contaminant concentrations did not significantly decrease regardless of storage temperature well beyond their specified maximum holding times with the exception of PAHs.** For the 17 PAH compounds that were quantified, it appeared that the number of aromatic rings may influence the degradation during storage. Losses of up to 50% of the initial concentrations occurred for compounds with relatively low molecular weights including acenaphthene, fluorene, dibenzothipene, phenanthrene and anthracene.

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## US Army Corps of Engineers Support

Ken Skahn of EPA's Superfund office in Washington, DC again reminds regional staff that the US Army Corps of Engineers can offer technical support services for small projects (e.g., \$25K to \$50K) such as 5 year reviews, optimization studies, value engineering reviews, etc. Please contact him if you have a project to propose. Funding will be provided on a first come basis until the remaining funds are utilized. Approximately \$1.5M remains for this purpose.

Ken can be reached at <skahn.ken@epa.gov> or (703)603-8801.

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## Engineering Forum Recruitment

We're Looking For a Few Good Engineering Professionals.....

A national workgroup, known as the *Engineering Forum*, is soliciting for new members from the EPA regional Superfund and RCRA staff.

The *Engineering Forum* is one of the three Forums established under the Office of Solid Waste and Emergency Response (OSWER) and the Office of Research and Development (ORD) as the Technical Support Project (TSP) back in 1987. The other Forums are the *Ground Water Forum* and the *Federal Facilities Forum*. EPA headquarters, ORD, the US Army Corps of Engineers, and state personnel also participate on the Forums. Forum members work to improve communications and assist in technical transfer between EPA regional and laboratory staff on nationally significant topics. Members participate in monthly conference calls and meet semi-annually to discuss technical and policy issues, new technologies, and to network with academic experts and other federal agencies. In addition to providing technical assistance to regional staff, products generated typically include "Issue Papers" or other reference materials. For more information, go to <http://www.epa.gov/tio/tsp>.

The *Engineering Forum* consists of engineers and other technical staff that support the Superfund and RCRA programs in each of the ten EPA regional offices. The group was organized to exchange up-to-date information related specifically to engineering remediation issues at Superfund and RCRA sites. The goal is to have at least two members per region on the Forum - one Superfund and one RCRA. **This solicitation is to fill some empty slots.** The time commitment is between 2-5% and regional travel expenses are minimized since the Office of Superfund Remediation and Technology Innovation (OSRTI) picks up member lodging costs for the semi-annual meetings. Some of our current topics have included:

- updating 8 issue papers covering numerous treatment topics;
- tech talks (perchlorate, ZVI-clay technology, solar-powered remediation); and
- agenda preparation for upcoming meetings (including a nanotech session at NARPM in May)

The last TSP meeting was held in conjunction with the Groundwater Resources Association of California in Long Beach in November 2006. The meeting covered “High Resolution Site Characterization and Monitoring”. The TSP project meets jointly with the National Association of Remedial Project Managers (NARPM), including this May (2007). Minutes from previous meetings can be found on the TSP website: (<http://www.epa.gov/tio/tsp/meetings.htm>).

If you are a Superfund or RCRA engineer or scientist and are interested in being involved in technical issues that are of national importance, please consider joining the *Engineering Forum*. Please contact any of the current co-chairs, Jon Bornholm of Region 4 (404-562-8820), Mike Gill of Region 9 (415-972-3054), or Steve Kinser of Region 7 (913-551-7728), or your regional rep with any questions.

For the latest on the activities of all of the Forums, see this "Highlights" report.....

[http://www.epa.gov/tio/tsp/download/2006\\_fall\\_meeting/tsp\\_highlights.pdf](http://www.epa.gov/tio/tsp/download/2006_fall_meeting/tsp_highlights.pdf)

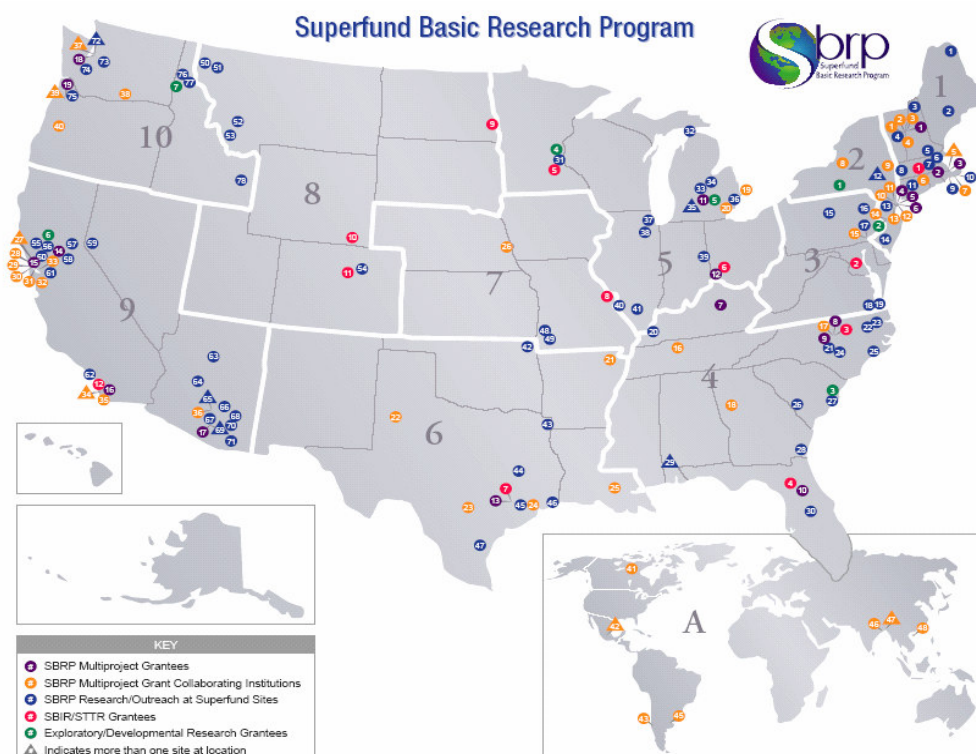
The Engineering Forum Regional representatives (as of March 2007) are listed here....

<http://www.epa.gov/tio/tsp/engmembe.htm>

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## Superfund Basic Research Program (SBRP) Research Articles

The SBRP has funded research/outreach activities at over 100 hazardous waste sites. It falls under the National Institute of Environmental Health Sciences (NIEHS). This research is described in detail on their webpage (<http://www-apps.niehs.nih.gov/sbrp/>) and the locations are shown on the map below.



Here are the titles of the recent papers released by the SBRP since early 2006. For more details on these or past research briefs by year, go to: <http://www-apps.niehs.nih.gov/sbrp/researchbriefs/index.cfm> .

1. Biodegradation of Simple Chemical Mixtures in Soil
2. The Human Genetics of Arsenic Biotransformation
3. Mobilization of Arsenic in Sediments
4. Impacts of In Utero and Early Childhood Exposure to Arsenic in Drinking Water
5. New Technologies for Remediation of Halogenated Organics
6. MTBE Biodegradation by *Methylobium petroleiphilum* gen. nov, sp. nov., a methylotroph of the Betaproteobacteria (formerly known as PM-1)
7. Bromodichloromethane and Pregnancy Loss
8. MMA(III) – a Role in Arsenic Carcinogenesis
9. Nanoparticle Immunoassays - Advances & Spin-offs
10. Toxicological Assessment of Remediated Environmental Chemicals
11. A Comparative Toxicology Study of Metals Mixtures
12. Arsenic Affects All Five Steroid Receptors
13. Groundwater Contamination by Perchlorate from Brines
14. Microbial and Photolytic Transformations of Environmental Contaminants
15. Dual Role for Vitamin C in Cr(VI) Toxicity

## National Institutes of Health Commercialization Assistance Program (NIH-CAP)

Dr. Chang Yul Cha, President of the Cha Corporation, has been invited to participate in the National Institutes of Health Commercialization Assistance Program (NIH-CAP).



The NIH-CAP is designed to help some of the nation's most promising life science small companies develop their commercial business and transition their SBIR-developed products into the marketplace. Dr. Cha developed his microwave technology under the National Institute of Environmental Health Sciences Small Business Innovation Research (SBIR) Phase I and Phase II grants.

During Phase I, Dr. Cha constructed a field-ready prototype microwave reactor system and successfully operated it for more than two months at the former McClellan Air Force Base in Sacramento, California. This demonstration showed that microwave technology can be a cost-effective solution for recovering chemicals from soil vapor produced from Superfund Site remediation operations. These field-testing results strongly indicate that microwave regeneration restores the working adsorption capacity of carbon and that the hydrocarbons adsorbed onto carbon in each adsorption cycle are recovered during successive microwave regenerations. Over the past few years, EPA staff have heard from Dr. Cha about this technology a number of times, with his visit to Region 9 in February, 2004 and also with our 2 visits to the site (in October, 2004 and May, 2006).

For the complete story, see:

[http://www-apps.niehs.nih.gov/sbrp/products/products2\\_s1\\_s6.cfm](http://www-apps.niehs.nih.gov/sbrp/products/products2_s1_s6.cfm)

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# LOCAL NEWS

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## Cooper Drum Superfund Site: A Field Pilot Study of In-Situ Chemical Oxidation Using Ozone and Hydrogen Peroxide

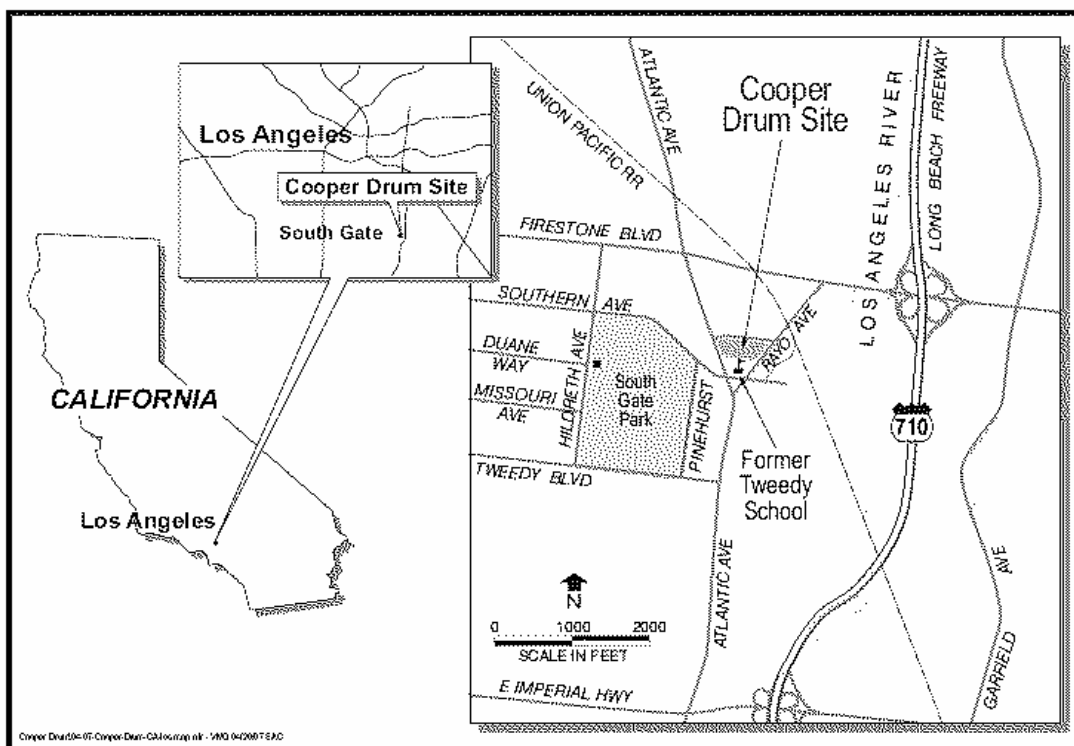
*(The following entry was edited from the reference: Field Pilot Study of In Situ Chemical Oxidation Using Ozone and Hydrogen Peroxide, Executive Summary Cooper Drum Company Superfund Site, December 2006. Two Region 9 employees, Eric Yunker and Herb Levine, as well as ORD scientist Michelle Simon (from the Cincinnati Lab), were nominated for a Region 9 / OSWER Notable Achievement Award because of their work on this site. Congrats to all of them!)*

This summary presents the results of a field pilot study using an in-situ chemical oxidation (ISCO) technology at the Cooper Drum Company Superfund Site (Site) in South Gate, Los Angeles County, California. A full report is also available.

The ISCO technology used in this field pilot study is an advanced oxidation process (AOP) using the application of ozone and ozone with hydrogen peroxide. Given the Site groundwater contaminants (1,4-dioxane and volatile organic compounds [VOCs]), the ISCO process is considered a breakthrough technology. The field pilot study was conducted during the remedial design (RD) phase by EPA to determine whether to include ISCO as part of the groundwater remedy for the Site. Use of an ISCO technology is consistent with the groundwater cleanup strategy contained in the Cooper Drum Record of Decision (ROD). As discussed below, the field pilot study results showed reductions of up to approximately 90% in the site groundwater contaminants of concern (COCs).

This project provides a good example of teamwork between the Region 9 office and ORD's National Risk Management Research Lab in Cincinnati, OH. Region 9's need for an innovative remedy for the Cooper Drum site drove the issue, but their collaboration with other stakeholders, including technical assistance from the ORD Lab, was important in the project's success. The project team consisted of the EPA Region 9 Superfund Project Manager (Eric Yunker), EPA Office of Research and Development (Michelle Simon), URS Group, Inc., Project Manager (Don Gruber), URS Group, Inc., Senior Engineer (Venus Sadeghi), and Applied Process Technology, Inc. (APT) (Doug Gustafson). The work plan for the pilot study was reviewed and approved by the California Environmental Protection Agency Department of Toxic Substances Control (DTSC).





## BACKGROUND

The use of ozone/hydrogen peroxide was evaluated because 1,4-dioxane is purportedly resistant to biodegradation. The use of ozone/hydrogen peroxide for in-situ treatment of 1,4-dioxane is innovative and up until the time of this study (Dec, 2006), it was not known to have been implemented at other sites. This was in part because 1,4-dioxane is an emergent chemical that has not been monitored routinely in California groundwater. Combined ozone and hydrogen peroxide has been used for ex-situ treatment of 1,4-dioxane, but not in-situ, so this was considered a new application.

Before performing the ISCO pilot study, an enhanced reductive dechlorination field pilot study was performed at the site using a hydrogen release compound (HRC®). The HRC® pilot study was conducted to evaluate whether the naturally reductive conditions in the site groundwater could be enhanced to promote complete reductive dechlorination of groundwater COCs. During the HRC® pilot study, groundwater monitoring results for emergent compounds showed the presence of 1,4-dioxane. Because the reductive dechlorination process was not found to be effective on this compound, the HRC® Field Pilot Study was discontinued. Consequently, an ISCO bench-scale test was performed in May 2005 on the Site soil and groundwater to evaluate the effectiveness of using ozone and ozone combined with hydrogen peroxide to remediate site groundwater. The results indicated that ozone alone, as well as ozone combined with hydrogen peroxide, was equally effective in destroying all detected COCs in groundwater. The removal of 1,4-dioxane was apparently

enhanced/facilitated by the presence of natural constituents, such as iron and bicarbonate, in the Site soil and groundwater.

## **PILOT STUDY DESIGN AND OPERATIONS**

Data obtained from the bench-scale test and groundwater monitoring performed through April 2005 were used to design and initiate the ISCO pilot study in July 2005. The location of the pilot study was approximately 140 feet downgradient from the main contaminant source area. The installation consisted of a barrier configuration with three ozone/hydrogen peroxide injection wells laterally spaced from 35 and 50 feet apart. Each injection well contained two injection points at approximately 70 and 90 feet below ground surface (bgs). The pilot study monitor wells were located downgradient and within a maximum of 30 feet of the three injection wells. Each monitor well location included a shallow (approximately 60 to 63 feet bgs) and deep (85 feet bgs) sampling depth. The pilot study took place between July 2005 and June 2006 for a period of 321 days. Oxidant injection during this period generally consisted of alternating ozone only injections with mixed ozone/hydrogen peroxide injections over the test period.

By monitoring dissolved oxygen (DO) and oxidation reduction potential (ORP) and modifying oxidant injection rates, the optimal system operating parameters were eventually achieved.

## **MONITORING RESULTS**

In-situ oxidation of site COCs, including trichloroethene (TCE), cis-1,2-dichloroethene (DCE), 1,1-dichloroethane (DCA), and 1,4-dioxane, was observed in all wells, with significant reductions (up to 90%) in concentrations of both TCE and 1,4-dioxane, which are the primary COCs. The largest decreases in concentration were observed from the three shallow monitor wells. Concentration trends were unique for each well during the pilot study.

Over the first 5 months of the pilot study, COC concentrations generally showed an overall decrease in the three shallow monitor wells and one deep well. After the 5-month period, when both ozone and hydrogen peroxide were being injected, COC concentrations increased slightly and/or stabilized in the two shallow monitor wells. This stabilized trend persisted in one shallow well and continued even after initiation of the focused injection. Once the ozone injection rate was increased in the mixed oxidants, the VOCs concentrations decreased a great deal more.

## **CONCLUSIONS**

Based on the pilot study monitor well results, the following conclusions were made for the Site. Many of these conclusions are site-specific, but could be extrapolated to other sites.

· Ozone. Ozone injection alone significantly reduced the concentrations of the site COCs, including TCE, cis-1,2-DCE, 1,1-DCA, and 1,4-dioxane. At the end of the pilot study, concentrations of 7 out of the 12 Site COCs at one well were reduced to below MCLs (PCE was below MCLs prior to the test and remained as such.). Those still present at concentrations greater than MCLs at this well included TCE (65 mg/L), cis-DCE (44 mg/L), 1,1-DCA (6.2 mg/L), and 1,4-dioxane (47 mg/L).

· Quantity of Oxidants. Increased injection of oxidants increases the amount of contaminant destruction.

· Oxidant Ratios. The effect of hydrogen peroxide on COC destruction is not clear. However, ex-situ testing of the Site groundwater does indicate that it is likely that the injection of stoichiometric (0.7-to-1 mole:mole) or less of hydrogen peroxide to ozone is required to achieve optimal results and to increase oxidation kinetics. This conclusion is supported by the results of laboratory tests conducted to evaluate the destruction efficiency of 1,4-dioxane; one literature source cites the optimal hydrogen peroxide to ozone mole ratio as being greater than zero but less than 0.4 to 0.45 mole:mole (Suh and Mohseni, 2004).

· Presence of Other Compounds. As corroborated by the bench-test results, the presence of high levels of secondary constituents in the groundwater (e.g., iron, bicarbonates, organic matter) may have enhanced the effectiveness of oxidation by ozone. The presence of these compounds also can lead to scaling, biofouling, and general plugging of equipment installed below the water table. However, during the pilot study, only one well became plugged, and it was easily rehabilitated with a dilute acid.

· Injection Rates. Ozone injection rates were crucial to the success of the pilot study. Whereas the soil oxidant demand estimated in the bench test (3 grams per kilogram [g/kg]) appears to have been too high, the pilot study results indicated that an ozone injection rate of 2 pounds per day (lbs/day) per injection well (or 1 lb/day per injection interval) was required to achieve optimal results.

· Radius of Influence. Overall, a greater radius of influence (ROI) was achieved in the upper injection interval in the shallow aquifer. The ROI of the injection wells appeared to be approximately 30 feet, which is the largest distance between an injection well and a monitor well in the pilot study. Vertical profiling of DO and ORP indicated that, for optimal results, the oxidant injection interval probably should be placed a maximum of 10 feet below the targeted treatment area. In addition, the presence of less permeable aquifer material in the 40- to 50-foot bgs interval probably increased the ROI for the shallow injection wells. Therefore, the larger ROI in the upper portion of the shallow aquifer (approximately 50 to 80 feet bgs) may have been related to the injection screen placement and should be considered in full-scale application of the technology.

· Field Measurements. Data logging and the real-time measurement of field parameters, specifically DO and ORP, was crucial to the optimization of the operating parameters.

· Air Injection Rates. The rate of air injection was found not to be a very important factor, though higher injection rates (>1 cubic foot per minute [cfm]) should be avoided to minimize agitating fine sediments in the aquifer.

· Bacteria: Pros and Cons. The introduction of air and oxidants resulted in highly oxygenated and aerobic conditions, which probably promoted the growth of aerobic bacteria. While these bacteria may contribute to direct and/or cometabolic degradation of some COCs, they may cause some biofouling and possible plugging of submerged equipment.

· Rebound. There was a zero to modest rebound of COC concentrations in the pilot study monitor wells in August 2006, three months after cessation of the pilot study. Some rebound was expected because contaminated plumes originating 30 feet or further upgradient were expected to reach the pilot study area during this time. Modest rebound was observed where the largest reductions in concentrations had been obtained during the pilot study. Other areas showed some rebound and conversely some continued to decline during the three months.

## RECOMMENDATIONS

A number of recommendations were made for this Site, but they tended to be specific to the Site. The recommendations included:

- build a full-scale application of the pilot study,
- inject both ozone and hydrogen peroxide, but pay close attention to stoichiometric mole ratios,
- combine remedies to have the ISCO system address concentrations greater than 50 mg/L, and another remedy to address downgradient lower concentrations (per the ROD),
- place injection wells so that their ROIs overlap for adequate coverage, and be aware of well screen placement,
- design for appropriate ozone injection rates, and
- be sure that remediation of the contaminated vadose zone in the source area occur before or concurrently with the full-scale groundwater remediation to minimize further impacts to groundwater.

**In summary, once the system operating parameters were optimized, the ozone/peroxide injection system was successful in achieving the test objectives of evaluating system performance and reducing COC concentrations without significant rebound.**

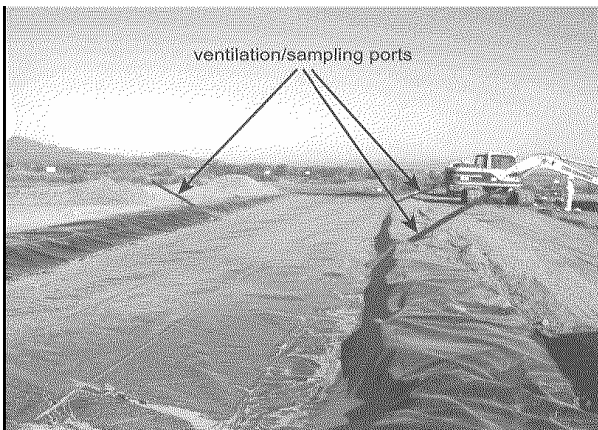
## EPA Evaluates Cost and Performance of Blood Meal-Enhanced Anaerobic Bioremediation of Toxaphene-Contaminated Soil

(Edited from Tech News and Trends, January, 2007)

The U.S. EPA Environmental Response Team Center (ERTC) initiated field-scale studies in January 2001 on the use of anaerobic bioremediation for treating toxaphene contaminated soil at the Gila River Indian Community (GRIC) site in Chandler, AZ. In early 2003, a similar remediation strategy was formulated for the Gila River Boundary (GRB) site near Laveen, AZ, and another toxaphene contaminated site of the GRIC Reservation. Both applications used blood meal as a nutrient to stimulate contaminant degradation by indigenous anaerobic microorganisms. Using a toxaphene cleanup goal of 17ppm, ERTC and EPA Region 9 recently evaluated the performance and cost of these large-scale anaerobic applications.

For the complete article, see: <http://www.clu-in.org/download/newsletters/tnandt0107.pdf>

*Contributed by Harry L. Allen, U.S. EPA ERTC (allen.harry@epa.gov or 732-321-6747) and Harry L. Allen IV, U.S. EPA Region 9 (allen.harryl@epa.gov or 415-972-3063).*



*Each GRB treatment cell was equipped with three ventilation / sampling ports to permit sampling and off-gassing without removal of the cover.*

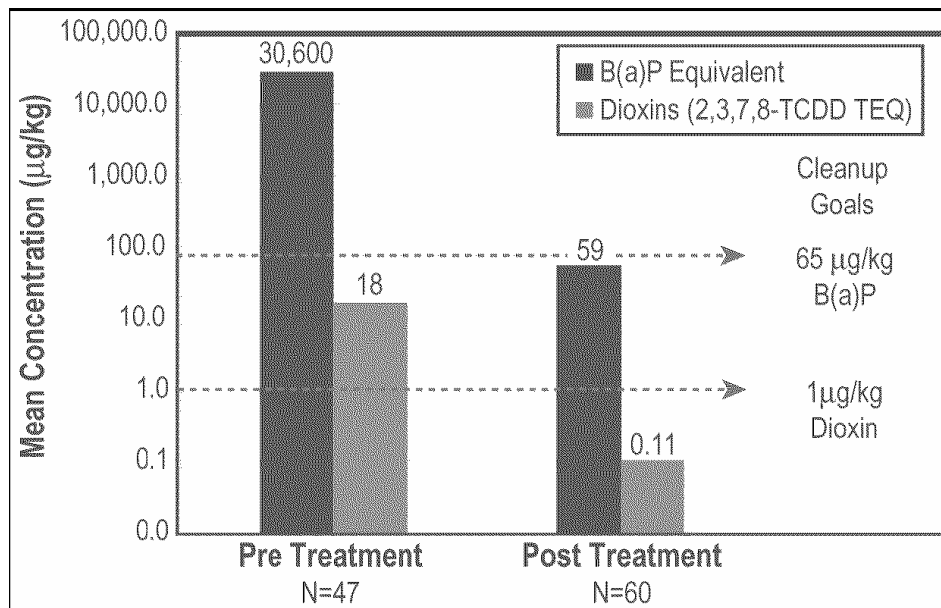
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## In-Situ Thermal Remediation Completed on Wood-Treatment Waste

(Edited from Tech News and Trends, January, 2007)

After four years of operation, full-scale insitu thermal remediation of soil at Southern California Edison's former wood treatment site in Alhambra, CA, concluded last spring. Subsurface soil containing PAHs, PCP, and dioxins/furans was treated by in-situ thermal

desorption (ISTD), a technology employing the simultaneous application of thermal conduction heating and vacuum to treat soil without excavation. Treatment achieved cleanup goals for approximately 16,500 yd<sup>3</sup> of predominantly silty soil to a depth of 105 ft, and provided the opportunity for property reuse without restrictions. The total project cost was \$13 million, estimated to be 40% lower than soil excavation. Costs for ISTD implementation at sites with similar settings could potentially be reduced 47% by applying lessons learned during the Alhambra application.



*Mean concentrations of posttreatment soil samples showed nearly complete removal or destruction of PAH concentrations (based on B(a)P-E) and dioxins (based on 2,3,7,8-tetrachlorodibenzodioxin equivalents).*

For the complete article, see: <http://www.clu-in.org/download/newsletters/tnandt0107.pdf>

*Contributed by Tedd Yargeau, Cal EPA Department of Toxic Substances Control (tyargeau@dtsc.ca.gov or 818-551-2864) and John Bierschenk, TerraTherm, Inc. (jbierschenk@terra therm.com or 978-343-0300).*



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# DATEBOOK - UPCOMING EVENTS

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This section of the newsletter is an attempt to present both EPA and non-EPA sponsored environmental technology related courses and conferences. But being a quarterly publication, it is impossible for this newsletter to always be up-to-date. For the most pertinent information on upcoming EPA courses, see <http://www.trainex.org>. These events are listed chronologically.

Many of the entries in these newsletters are from TIO's "TechDirect" emails (thank you Jeff Heimerman!). TechDirect prefers to concentrate mainly on new documents and the internet live events. However, they do support an area on the CLU-IN webpage where announcement of conferences and courses can be regularly posted. Sponsors can input information on their events at <http://clu-in.org/courses>. Likewise, the page has an area for upcoming events that might be of interest. It allows users to search events by location, topic, time period, etc.

Many of you know that [www.clu-in.org](http://www.clu-in.org) routinely place seminars in the CLU-IN Studio archive after they have aired. This provides access to the slides and the audio file for each presentation. Some of you requested that we make these audio files more portable. Now they have done that. For more recent seminars, you now have the option to download them in MP3 format which will allow you to listen via portable music players. You may also subscribe to their podcast feed, which will alert you when new seminar archives are available. For more information, see <http://clu-in.org/live/archive.cfm>.

CLU-IN Training Area. A training section has been posted to CLU-IN. The Training page offers visitors a quick glimpse of upcoming training opportunities in a monthly view as well as a running list of events. Links to upcoming Conference Webcasts, Trainex and Archived Internet Seminars and Podcasts are available on the Training Page. See: <http://www.cluin.org/training>.

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## **ITRC Internet Based Training**

These are typically 1-2 hour online courses where the participant follows a webpage presentation, while listening on the phone. Check - <http://www.itrcweb.org> or <http://www.clu-in.org/studio/seminar.cfm> for times and registration.

*NOTE: All dates/times are subject to change – check <http://www.itrcweb.org> for the most up-to-date information.*

**NOTE: All dates/times are subject to change – check [www.itrcweb.org](http://www.itrcweb.org) for the most up-to-date information.**

April 24<sup>th</sup> - *Planning and Promoting Ecological Land Reuse of Remediated Sites*  
2:00 p.m. to 4:15 p.m. EASTERN Time

April 26<sup>th</sup> - *Evaluating, Optimizing, or Ending Post-Closure Care at Municipal Solid Waste Landfills*  
11:00 a.m. - 1:15 p.m. EASTERN Time

May 8<sup>th</sup> - *Vapor Intrusion Pathway: A Practical Guideline*  
2:00 p.m. to 4:15 p.m. EASTERN Time

May 15<sup>th</sup> - *Radiation Risk Assessment: Updates and Tools*  
2:00 p.m. to 4:15 p.m. EASTERN Time

May 17<sup>th</sup> - *An Overview of Direct Push Well Technology for Long-term Groundwater Monitoring*  
11:00 a.m. - 1:15 p.m. EASTERN Time

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#### OTHER INTERNET TRAINING

Nanotechnology - Applications and Implications for Superfund

This online training series, (from NIEHS and EPA), is being offered a number of times during 2007. Registration for all are available through <http://www.cluin.org> . Upcoming events include:

May 17<sup>th</sup>      *Nanotechnology - Environmental Sensors*  
August 16<sup>th</sup>   *Fate and Transport of Nanoparticles*

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National Sustainable Design Expo featuring EPA's P3 Award  
April 24-25, 2007  
Washington, DC  
<http://es.epa.gov/ncer/p3/expo/index.html>

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Association of State & Territorial Solid Waste Management Officials Mid Year meeting  
Apr 24-25, 2007  
Providence, RI  
Contact: Shannon Davis (415) 972-3440

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AFCEE Workshop on Enhanced In Situ Bioremediation  
24-25 April 2007  
San Antonio, TX

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Streamlined Investigations and Cleanup Using the Triad  
Approach

April 24-25, 2007

Los Angeles, CA

<http://www.trainex.org/offeringslist.cfm?courseid=300&all=yes>

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Passive Sampling Workshop and Symposium

April 24-26, 2007

Reston, VA

<http://www.trainex.org/offeringslist.cfm?courseid=515&all=yes>

[l=yes](http://www.trainex.org/offeringslist.cfm?courseid=515&all=yes)

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2007 Ground Water Summit

April 29-May 3, 2007

Albuquerque, New Mexico

<http://www.ngwa.org/e/conf/0704295095.cfm>

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"Hydrogeology of Fractured Rock: Characterization, Monitoring, Assessment, and  
Remediation"

April 30-May 3, 2007

Somerville, MA

<http://www.fractured-rock.com>

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9th International InSitu and On-Site Bioremediation Symposium

May 6-10, 2007

Baltimore, MD

<http://www.battelle.org/environment/er/conferences/biosymp/default.stm>

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May 7-10, 2007

National Brownfields & Land Revitalization Coordinators Meeting

Washington, DC

Contact: Tony Raia (202) 566-2758

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May 7-10, 2007

WasteExpo 2007

Atlanta, GA

<http://wasteexpo.com/>

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EPA Workshop  
"New Technology for Environmental Solutions--Collaborating for Results"  
May 8, 2007  
Dallas, Texas  
<http://www.scgcorp.com/etvsbir>

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EPA Region 10 Bacteria Conference  
May 14-15, 2007  
Tacoma, Washington  
<http://afrpamistest.net/EPA/>

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Annual RCRA Inspector Workshop (EPA Region 6)  
May 15-17, 2007  
New Orleans, LA  
<http://www.trainex.org/offeringslist.cfm?courseid=252&all=yes>

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The World Environmental and Water Resources Congress  
May 15-19, 2007  
Tampa, FL  
<http://content.asce.org/conferences/ewri2007/index.html>

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10th annual NSTI Nanotech 2007 and BioNano 2007  
May 20-24, 2007  
Santa Clara, California  
<http://www.nsti.org/Nanotech2007>

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EPA International Science Forum on Computational Toxicology  
May 21-23, 2007  
Research Triangle Park, NC  
<http://www.epa.gov/ncct/forum>

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The 2007 Joint Services Environmental Management (JSEM) Conference  
May 21-24, 2007  
Columbus, OH  
<http://www.jsemconference.com/2007/index.htm>

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NARPM Conference  
May 21-25, 2007  
Baltimore, MD  
<http://www.epanarpm.org>

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Annual CLP Training Conference  
May 22-24, 2007 (concurrent with the "NARPM" conference)  
Baltimore, MD  
Contact: Elizabeth Holman, (703) 603-8761

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The Third National Product Stewardship Forum  
May 30-31, 2007  
San Francisco, California  
<http://www.productstewardship.us/2007Forum>

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OSC 201  
June 4-6, 2007  
Las Vegas, NV  
<http://www.trainex.org/offeringslist.cfm?courseid=285&all=yes>

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Fifth International Symposium on Digital Earth (ISDE5)  
June 5-9, 2007  
University of California-Berkeley  
[www.ISDE5.org](http://www.ISDE5.org)

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Risk Assessors Annual Conference  
June 9-12, 2007  
Brooklyn, NY  
<http://www.trainex.org/offeringslist.cfm?courseid=460&all=yes>

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26th Annual Conference on Managing Environmental Quality Systems  
June 11-14, 2007  
Cleveland, OH  
<http://www.epa.gov/quality/meeting.html>

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Superfund Academy 101  
June 11-15, 2007  
Arlington, VA  
<http://www.trainex.org/offeringlist.cfm?courseid=254&all=yes>

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2007 EPA National Site Assessment Symposium and  
Training  
June 19-21, 2007  
Denver, CO  
<http://trainex.org/nsas/>

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EPA ORD Genomics Course 2: Microarray Data Evaluation for Use in Risk Assessment  
June 19-21, 2007  
Potomac Yards Facility, Arlington, VA

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2007 Community Involvement Conference and Training  
June 19-22, 2007  
Jacksonville, FL  
<http://www.epa.gov/superfund/action/community/ciconference/>

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The American Water Works Association (AWWA) 2007 Annual Conference and  
Exposition  
June 24-27, 2007  
Toronto, Ontario  
<http://www.awwa.org/ace07/>

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11th Annual Green Chemistry Conference  
June 25-27, 2007  
Washington, DC  
<http://www.gcande.org/>

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Environmental Remediation Technologies  
June 26-28, 2007  
Des Plaines, IL  
[http://www.trainex.org/offeringlist.cfm?courseid=2&all=  
yes](http://www.trainex.org/offeringlist.cfm?courseid=2&all=yes)

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The Air and Waste Management Association (A&WMA) 100th Annual Conference and Exhibition  
June 26-29, 2007  
Pittsburgh, PA  
<http://www.awma.org/ACE2007/>

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EPA Risk Assessment Forum  
July 9-13, 2007  
New York City, NY (Region 2 office)  
Contact: Jayne Michaud, (703) 603-8847

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Pharmaceuticals and Personal Care Products: State of the Science  
August 8-9, 2007  
Portland, Maine  
<http://www.neiwpcc.org/ppcpconference/>

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Chemistry for Environmental Professionals -Fundamentals  
August 14-15, 2007  
Indianapolis, IN  
<http://www.trainex.org/offeringslist.cfm?courseid=16&all=yes>

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Chemistry for Environmental Professionals - Applied  
August 16-17, 2007  
Indianapolis, IN  
<http://www.trainex.org/offeringslist.cfm?courseid=66&all=yes>

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23rd National Environmental Monitoring Conference  
August 20-24, 2007  
Cambridge, MA  
<http://www.nemc.us/>

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Introduction to Ground Water Investigations  
August 21-23, 2007  
Cincinnati, OH  
<http://trainex.org/classdetails.cfm?courseid=6&classid=2867>

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Introductory Risk Assessment Guidance for Superfund  
September 11-13, 2007  
EPA Region 9 - Exact location to be determined  
<http://trainex.org/classdetails.cfm?courseid=24&classid=2865>

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Preliminary Assessment and Site Inspection Training  
September 11-14, 2007  
Los Angeles, CA  
<http://www.trainex.org/offeringslist.cfm?courseid=457&all=yes>

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Hazard Ranking System  
September 18-21, 2007  
Los Angeles, CA  
<http://www.trainex.org/offeringslist.cfm?courseid=38&all=yes>

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2007 NGWA/U.S. EPA Fractured Rock Conference:  
State of the Science and Measuring Success in  
Remediation  
September 24-26, 2007  
Portland, ME  
<http://www.ngwa.org/e/conf/0709245017.cfm>

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22nd Annual North American Hazardous Materials Management Conference  
October 8-12, 2007  
San Diego, California  
Contact: Dee Johnson at paloma@well.com or (510) 530-6048

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23rd Annual International Conference on Soils, Sediments and Water Analysis, Site  
Assessment, Fate, Environmental and Human Risk Assessment, Remediation and  
Regulation  
October 15-18, 2007  
Amherst, MA  
<http://www.umasssoils.com>

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Fall 2007 NATIONAL SBIR/STTR SBIR Conference  
October 29 - November 1, 2007  
Richardson, TX  
[http://www.texasone.us/site/PageServer?pagename=nat\\_conference](http://www.texasone.us/site/PageServer?pagename=nat_conference)

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OSC 201

December 3-5, 2007

Kansas City, KS

<http://www.trainex.org/offeringslist.cfm?courseid=285&all=yes>

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SERDP/ESTCP SYMPOSIUM: Partners in Environmental Technology Technical  
Symposium & Workshop

December 4-6, 2007

Washington, D.C.

<http://www.estcp.org>

<http://www.serd.org/>

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Brownfields 2008

May 5-7, 2008

Detroit, MI

<http://www.brownfields2008.org>

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## W E B P A G E S

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### Region 9 Library Notice

(From Deborra Samuels and Rosemary Hardy, Region 9 Librarians)

Hi Folks,

Wanted to make sure you knew of this useful EPA website providing online access to a large selection of Superfund technical and policy documents.

[Remember, not all Superfund-related documents are located through this website and Rosemary Hardy and I are always happy to assist you with your information needs. Contact info and library hours are located below.]

**Superfund Remedy Decisions** webpage:

<http://www.epa.gov/superfund/action/guidance/remedy/index.htm>.

Here is a list of the categories currently covered:

Remedy Selection Guidance and Policies  
Alternate Concentration Limits (ACLs)  
Applicable or Relevant and Appropriate Requirements (ARARS)  
Risk Assessment  
Institutional Controls, Land Use and Relocations  
Remedial Investigations/Feasibility Studies & Treatability Studies & Costing  
Waste Management  
Removal Responses  
Technology Considerations  
Headquarters Consultation and National Remedy Review Board (NRRB)  
Remedy Documentation  
Remedial Design/Remedial Action Guidance  
Post Construction Completion Guidance  
Update Remedy Decisions at Select Sites  
Community Involvement  
State and Tribal Involvement  
Federal Facility Clean Up  
Superfund Regulations & Enforcement  
Superseded Remedy Guidance Documents  
Superfund Decision Document (e.g. RODs)  
Superfund Contaminant Specific Links

EPA Region 9 EIC/Library

13th Floor

9:00 a.m. - 12:00 p.m. and 1:00 p.m. - 4:00 p.m. (M-Th)

Closed for lunch and on Fridays.

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## [Announcing EPA's New Human Health Research Program Website](#)

Find out about the latest information on science being conducted or directed by EPA's Office of Research and Development (ORD) to protect public health on a new Human Health Research Program Web site: <http://www.epa.gov/hhrp> .

Visitors to the site will find an overview of ORD's research to provide the methods, models, tools, and data needed to advance risk assessments to protect public health. The site also provides information on how the science has contributed to decision making, a list of journal publications and reports, fact sheets, and current news.

The site was developed by ORD's Human Health Research Program, one of eight multidisciplinary research programs providing strategic approaches to addressing the research needs of the Agency.

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## ITRC Case Study Database

The ITRC Enhanced Attenuation of Chlorinated Organics (EACO) Case Study Database Web Page, housed on the AFCEE Technology Transfer web site, is now available online. The web page is being used to collect case studies of both successful and unsuccessful technology demonstrations using enhanced attenuation (EA) in combination with monitored natural attenuation (MNA). The case studies collected in the EACO database will be published as an appendix in the ITRC EACO Team ([http://www.itrcweb.org/teampublic\\_EACO.asp](http://www.itrcweb.org/teampublic_EACO.asp)) Technical and Regulatory document to be published in early 2008. The document will act as a technical guidance intended to broaden the use of enhanced attenuation as a bridge between more aggressive treatments and MNA. Additionally, the case studies will form the basis for many of the EACO Team's evaluations of EACO applications.

If there is a particular remediation strategy that lacks documentation or that is not properly considered in the traditional MNA protocol, inclusion in the EACO database is an excellent chance to bring it to the attention of many regulators, remediation professionals, site owners, and other stakeholders. All interested parties are encouraged to visit the EACO Case Study Web Page, apply for an account, and enter their EACO case studies. The web page is currently scheduled to be available online through March 2007. To access the database, see: <http://www.afcee.brooks.af.mil/products/techtrans/info/>.

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## New CLU-IN Software and Tools Area

A new software and tools section has been posted to CLU-IN. This new area offers information on individual software packages and online tools to assist visitors as well as links to other sources of free software and tools. CLU-IN are also interested in additional software packages you would like them add to this area.

See <http://www.clu-in.org/software> for a list of resources and their suggestion form.

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## EUGRIS Corner

New documents are available on EUGRIS, the platform for European contaminated soil and water information. Click <http://www.eugris.info/DisplayNewsItem.asp?NewsID=400> to access important new

information from Europe, including the following documents and web links. Look at the New RESOURCES section under NEWS. More than 25 new resources, projects and news items were added to EUGRIS in March 2007. These include:

**European Union Strategic Framework 7 Environmental Technologies Info Day Session**

<http://www.cluin.org/envirotechinfoday/>

**The Urban Environment**

(March 2007, 232 pages)

<http://www.rcep.org.uk/urban/report/urban-environment.pdf>

**After Minerals Website**

<http://www.afterminerals.com>

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## RECENT DOCUMENTS, DATABASES, ETC.

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These entries are arranged alphabetically. Thanks to TechDirect, Tech Trends, NRMRL News, the ETV Program, DOE, DoD and others for posting their latest documents. And remember, many of these are available in paper format in the Region 9 library. Use your local library.....or it may disappear. It's happening at EPA.....

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**Advancing Best Management Practices: Applying the Triad Approach in the Superfund Program to Reference Documents/Internet Resources**

(EPA memorandum)

(September 2006, 12 pages)

[http://www.triadcentral.org/ref/ref/documents/Triad\\_Policy\\_Memo.pdf](http://www.triadcentral.org/ref/ref/documents/Triad_Policy_Memo.pdf)

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**Comparison of Geoprobe: PRT and AMS GVP Soil-Gas Sampling Systems with Dedicated Vapor Probes in Sandy Soils at the Raymark Superfund Site**

(EPA 600-R-06-111)

(November 2006, 79 pages)

<http://www.epa.gov/ada/download/reports/600R06111/600R06111.pdf>

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EUGRIS Corner. New Documents on EUGRIS, the platform for European contaminated soil and water information.

<http://www.eugris.info/Whatsnew.asp>

Proceeding of Nordrocs. First Joint Nordic Conference on the Remediation of Contaminated sites

20-21 September 2006

Malm, Sweden

Parallel sessions on: contaminated waters and sediments; contaminant leaching; state-of-the-art projects from the Nordic countries; remediation technologies; risk assessment.

Underground Under Threat: the State of Groundwater in England and Wales (October 2006, 24 pages)

Underground, Under Threat. Groundwater Protection: Policy and Practice. 4 parts:

Part 1 - Overview : Our overall position at the UK Environment Agency on the management and protection of groundwater and an overview that identifies our goals

Part 2 - Technical Framework: A basic introduction to groundwater and its place in the water cycle; Key principles and concepts; Description of the threats from human activities

Part 3 - Tools: Introduction to the tools available for analyzing and assessing the risks to groundwater; A brief overview of the use and application of each tool and where to obtain it

Part 4 - Position Statements: Key groundwater legislation and how we interpret it; Position Statements on activities that pose a risk to groundwater and how we plan to deal with them

FP7: Tomorrow's Answers Start Today.  
(Produced by the European Commission)  
(2007, 32 pages)

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Evaluation of the Role of Dehalococcoides Organisms in the Natural Attenuation of Chlorinated Ethylenes in Ground Water

(EPA 600-R-06-029)

(June 2006, 121 pages)

<http://www.epa.gov/ada/download/reports/600R06029/600R06029.pdf>

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Frequently Asked Questions about Ecological Revitalization of Superfund Sites  
(EPA 542-F-06-002)  
(December 2006, 12 pages)  
<http://www.clu-in.org/download/remed/542f06002.pdf>

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Grant Guidelines To States For Implementing The Financial Responsibility And Installer Certification Provision Of The Energy Policy Act Of 2005  
(EPA 510-R-07-002)  
(January 2007, 10 pages)  
[http://www.epa.gov/oust/fedlaws/final\\_fr.htm](http://www.epa.gov/oust/fedlaws/final_fr.htm)

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(January 2007, 13 pages)  
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(August 2006, 62 pages)  
[http://www.clu-in.org/download/studentpapers/A.\\_Corker\\_Industry\\_Residuals\\_1-3-07.pdf](http://www.clu-in.org/download/studentpapers/A._Corker_Industry_Residuals_1-3-07.pdf)

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Microfracture Surface Characterizations: Implications for In Situ Remedial Methods in Fractured Rock  
(EPA 600-R-05-121)  
(June 2006, 99 pages)  
<http://www.epa.gov/ada/download/reports/600R05121/600R05121.pdf>

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Nanotechnology for Site Remediation: Fate and Transport of Nanoparticles in Soil and Water Systems  
(August 2006, 16 pages)  
[http://www.clu-in.org/download/studentpapers/B\\_Latif\\_Nanotechnology.pdf](http://www.clu-in.org/download/studentpapers/B_Latif_Nanotechnology.pdf)

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New Perchlorate Analytical Methods  
<http://www.epa.gov/epaoswer/hazwaste/test/new-meth.htm>

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Protocol for Use of Five Passive Samplers to Sample for a Variety of Contaminants in Groundwater (DSP-5)  
(February 2007, 121 pages)  
<http://www.itrcweb.org/Documents/DSP-5.pdf>

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Revitalizing America's Mills: A Report on Brownfields Mills Projects  
(EPA 560-R-06-001)  
(November 2006, 32 pages)  
[http://www.epa.gov/docs/swerosps/bf/policy/Mill\\_Report\\_110306.pdf](http://www.epa.gov/docs/swerosps/bf/policy/Mill_Report_110306.pdf)

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Status Report on Innovative In Situ Treatment Technologies Available to Treat Perchlorate-Contaminated Groundwater  
(August 2006, 88 pages)  
[http://www.clu-in.org/download/studentpapers/J\\_Hoponick\\_Final.pdf](http://www.clu-in.org/download/studentpapers/J_Hoponick_Final.pdf)

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Technical Support Times Issue #5 - Focus on: Region 3 Optimization Study of Fund-Lead Pump-and-Treat Superfund Sites  
Winter 2007  
<http://www.epa.gov/osp/hstl/techsupp05.pdf>

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Technology News and Trends  
(EPA 542-N-06-007)  
(January 2007, 6 pages)  
<http://www.clu-in.org/download/newsltrs/tnandt0107.pdf>

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Technology News and Trends  
(EPA 542-N-06-007)  
(March 2007, 6 pages)  
<http://www.clu-in.org/download/newsltrs/tnandt0307.pdf>

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Updating Remedy Decisions at Select Superfund Sites - Summary Report FY 2004 and FY 2005  
(EPA-540-R-06-074)  
(February 2007, 83 pages)  
<http://www.epa.gov/superfund/programs/reforms/docs/urd04-05.pdf>

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# Serious Scientists Gather 'Round...

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## Strange Units of Measure:

Thanks to Region 9 hydrogeologist Kathy Baylor for pointing out this Wikipedia link to strange units of measurement:

[http://en.wikipedia.org/wiki/List\\_of\\_strange\\_units\\_of\\_measurement](http://en.wikipedia.org/wiki/List_of_strange_units_of_measurement) .

There are some strange ones here, but then again, didn't we already know that a "case of beer" was an official unit of monetary measure??

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And once again, here are a couple of humorous journal article titles:

TI: Toxicological Housekeeping Genes: Do They Really Keep the House?

AU: Arukwe, A

JN: Environmental Science and Technology

PD: 2006

VO: 40

NO: 24

PG: 7944-7949

PB: ACS AMERICAN CHEMICAL SOCIETY

IS: 0013-936X

PE: DEC 15

URL: <http://www.ingentaconnect.com/search/expand?unc=1065350407>

Click on the URL to access the article or to link to other issues of the publication.

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TI: Particulate matter from Chinese cooking

AU:

JN: Environmental Science and Technology

PD: 2007

VO: 41

NO: 1

PG: 8

PB: ACS AMERICAN CHEMICAL SOCIETY

IS: 0013-936X

PE: JAN 01

URL: <http://www.ingentaconnect.com/search/expand?unc=1070495492>

Click on the URL to access the article or to link to other issues of the publication.



### Disclaimer

This quarterly newsletter publication is meant to be used for information only. It does not represent the opinion of the management of the regional or national offices of EPA, only that of the author. The accuracy of the information contained herein is not guaranteed, only desired. If corrections are necessary, please contact the author. Thanks again to all of my information resources, which include EPA's OSRTI (formerly TIO), ORD (including ETV and NRMRL News) and Region 1's CEIT.

Thanks for reading it! Comments and suggestions are appreciated. If you wish to be added to or deleted from this list, please send me an email. (gill.michael@epa.gov)

Newsletter archives can be found on the EPA intranet site.....<http://www.epa.gov/osp/hstl/hstlnewsletter.htm>

A number of environmental technology web resources can be found here.....<http://www.epa.gov/region09/waste/techlinks/>

And don't forget the "STL" website.....<http://www.epa.gov/osp/hstl.htm>

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Mike Gill  
ORD Superfund and Technology Liaison  
US EPA Region 9 / SFD-84  
75 Hawthorne Street  
San Francisco, CA 94105  
415-972-3054  
415-947-3520 (Fax)  
Gill.Michael@epa.gov

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